

KEY WEST BACKGROUND TURBIDITY MONITORING

APPENDIX B - Standard Operating Procedures

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Servicing Procedures for the Hydrolab DataSonde 4a with 4-Beam Turbidity Sensor

October 10, 2003 - Revision 0

This procedure describes procedures to be used for the retrieval and redeployment of a Hydrolab (referenced above) for turbidity monitoring. This procedure should be documented using a project-specific field sheet (filename: KW-BkgrdTurbFldSht2.doc 9/15/03).

1.0 Retrieval: The Hydrolab is removed from its protective housing and is placed on shore or in the boat before it is detached from the wire cable. The time, date, location, and Hydrolab serial number are recorded on the field sheet.

2.0 Data Downloading: The data terminal is dried and connected to the data transfer cable that is connected to a notebook computer. Using the Hyperterminal program, the data is downloaded to the computer where they are saved as a text file and as space delimited Excel file and the filename is recorded on the field sheet. After saving both files to the computer's hard drive and to removable media, i.e., a compact disc or floppy disc, the previous Hydrolab program is deleted and a new program is created, documenting the program parameters on the field sheet. The Hydrolab time is checked and is corrected to within 30 seconds of the "correct" time obtained from a global positioning system unit. The internal battery potential is checked and batteries are changed if the potential is less than 9.7 volts.

3.0 Calibration and Cleaning: Retrieved instruments need to be checked to ensure the quality of data they have been collecting, cleaned of fouling materials, and recalibrated before redeployment.

3.1 Precalibration/Verification Readings: Before cleaning and calibrating the turbidity sensor, it is important to document the quality of data being collected at the time of retrieval. Before cleaning, the Hydrolab sensors are rinsed with turbidity-free water, i.e., filtered deionized water (DIW), and the sensors are placed in the darkened calibration cup with sufficient DIW to cover the 4-beam turbidity sensor with approximately 1.5 inches of water. The circulator is turned on for verifying and calibration procedures using the calibration cup. (A darkened cup is wrapped with aluminum foil or black electrical tape to reduce ambient light.) If the turbidity reading is not less than 0.5 NTU, the cup is emptied, rinsed and refilled with DIW and a second reading then is made and is recorded in the PreCal column of the field sheet. Depending upon the range of values in the system being monitored, either the low range calibration check standard (nominally 5 or 10 NTU) or the higher calibration standard (nominally 50 NTU) is measured next. Using a squeeze bottle filled with the appropriate standard, the Hydrolab sensors are rinsed to remove any clinging DIW before reading the selected standard in the darkened calibration cup and documenting the value on the field sheet.

3.2 Sensor Cleaning: The sensor may become fouled by the accumulation of hydrophobic material or the growth of bacteria, algae, and other marine organisms. After documenting the

quality of previously collected data, the 4-beam turbidity sensor is cleaned by gently wiping the sensor surfaces with a Q-tip or nonabrasive paper towel. A Liqui-nox solution and/or methanol or isopropanol may be used if needed.

3.3 Calibration: After cleaning, the turbidity sensor is calibrated using, in order, the DIW, calibration standard, and the low-range calibration check standard. Calibration is accomplished by first rinsing the sensors with the appropriate standard solution followed by immersion of the sensors (to ~ 1.5 inches) in that solution in the darkened calibration cup with the circulator turned on. Values are recorded on the field sheet. If the check standard reading fails to read in the acceptable range of ± 1 NTU + 5%, the sensors are recleaned and recalibrated or other appropriate actions are taken until acceptable readings are made.

4.0 Redeployment: Before redeployment, the circulator/stirrer is turned off and the weighted sensor guard is attached. Silicone is applied to the electrical prongs on the Hydrolab and the data terminal cap is positioned, "burped", and capped. The Hydrolab is tethered to the monitoring station before it is placed in a position where it might fall into the water. It then is transferred to the protective housing and secured at the proper depth to protrude from the end of the housing so that it will collect data from the water body and not from the enclosed space of the protective housing. The station and time of deployment should be recorded immediately on the field sheet.

KEY WEST BACKGROUND TURBIDITY MONITORING

Formazin Standards for Field Measurements with the Hydrolab DataSonde 4a

October 12, 2003 - Revision 0

This Standard Operating Procedure describes procedures to be used for making serial dilutions of 4000 NTU Forazin primary standard. Forazin standards are used for up to 48 hours after they are prepared. Care should be exercised when using Forazin to avoid dermal contact, inhalation of droplets, or ingestion. If a manufactured calibration standard, e.g., SableCal by Hach Company, is used, appropriate portions of the Documentation and Waste Disposal sections are to be followed.

1.0 Equipment: Class A or B volumetric, glass or plastic flasks and pipettes will be used to make turbidity standards for field use. Although various combinations of volumetric glassware or plasticware can be used, this example is written for use of a 1-liter flask to generate two liters of standard solution. A set of volumetric flasks and pipettes will be dedicated for use in making only turbidity standards.

One-gallon plastic jugs are used to store the prepared standard solutions for up to two days.

Squeeze bottles are used to rinse Hydrolab sensors with standard solutions before calibration. These bottles are dedicated for use with a single standard concentration.

All glassware and plasticware are decontaminated using Liqui-nox laboratory detergent prior to use and all are thoroughly rinsed with Deionized water (DIW) after use.

2.0 Reagent Solutions: Deionized water that is passed through a membrane filter with pore sizes of 0.2 μm or smaller is used as a diluent.

A 4000 NTU Forazin standard, obtained from a source of documented analytical quality, is the primary standard from which standards are made by serial dilutions.

3.0 Serial Dilutions: Calibration and check standards are made specifically for the environmental system being monitoring. During times of storms and situations when high levels of turbidity are expected, Hydrolabs are calibrated with higher standards, e.g., 100 NTU). Lower standards are used for calibrating during calmer, less turbid conditions.

Two liters of each standard is made at one time. DIW will serve as the zero standard.

Because Forazin "solutions" are truly suspensions of particulates, it is of the utmost importance that any standard is adequately shaken before any volume of liquid is dispensed for use. Consequently, before use the 4000 NTU primary standard should be shaken, with the cap firmly in place, by inverting the bottle with an end-over-end movement for 30 seconds. Squeeze bottles and one-gallon jugs are shaken and swirled to ensure homogeneous

distribution of particulates. The spouts of squeeze bottles are closed to ensure that no fluid is lost before adequate mixing has occurred.

Each milliliter of a 4000 NTU standard diluted to 2-liters will contribute 2 NTU to the final solution. For example, to make a 40 NTU serial dilution, 20 mL of 4000 NTU is diluted to one liter in the 1-liter volumetric flask. The flask contents are shaken to ensure adequate mixing before the flask is emptied into a one-gallon jug. The same volumetric flask is refilled with DIW that then is poured into the same one-gallon container providing a total volume of two liters. The calculation is:

$$\frac{20 \text{ mL} \times 4000 \text{ NTU}}{2000 \text{ mL}} = 40 \text{ NTU}$$

4.0 Documentation: One person prepares the serial dilutions, shaking the containers as appropriate and measuring the calculated volumes. A second person acts as an observer to ensure that all containers are appropriately shaken and that the desired volumes are properly measured.

All calculations made and volumes used are recorded on a field sheet that becomes a part of the official record for the project. Information regarding the Formazin supplier, lot number and expiration date, time and date of dilutions, preparer, and observer also is recorded.

5.0 Waste Disposal: Unused portions of standard solutions and collections of rinses from squeeze bottles will be disposed in a municipal sanitary sewer system.